CLAIMS

1. In a thermal swing adsorption process for the removal of contaminant from a gas stream, said process comprising a repeating cycle of steps including:

(i) contacting the gas stream with an adsorbent selective for the retention of a contaminant in order to adsorb at least a portion of the contaminant from the gas stream wherein this step (i) is conducted at an initial temperature;

(ii) heating the adsorbent to a first regeneration temperature in order to desorb at least a portion of the contaminant adsorbed in step (i); and

(iii) cooling the adsorbent to the initial temperature before starting a new cycle;

the improvement comprising a periodic heating step wherein the adsorbent is periodically heating to a second regeneration temperature greater than the first regeneration temperature.

2. The process of Claim 1 wherein the first regeneration temperature ranges from 40 to 200°C and the second regeneration temperature ranges from 200 to 400°C.

3. The process of Claim 1 wherein the second regeneration temperature is at least 50°C higher than the first regeneration temperature.

4. The process of Claim 1 wherein the periodic heating step is conducted just prior to start-up.

5. The process of Claim 1 wherein the periodic heating step is conducted just after a plant upset.

6. The process of Claim 1 wherein the frequency of the periodic heating step is triggered by a threshold level of CO_2 breakthrough.

7. The process of Claim 1 wherein the adsorbent comprises a zeolite and the contaminant comprises CO_2.

8. The process of Claim 7 wherein step (ii) involves contacting the adsorbent with a flow of regeneration gas having a linear velocity of at least 0.1 ft/sec.

9. The process of Claim 8 wherein step the regeneration gas is a dry N_2 rich gas.

10. The process of Claim 7 wherein the contaminant further comprises N_2O.

11. The process of Claim 10 where the adsorbent comprises a first layer of NaX zeolite for the removal of the CO_2 contaminant and a second layer of CaX zeolite for the removal of the N_2O contaminant.

12. The process of Claim 1 wherein the adsorbent is layered over a layer of desiccant.

13. The process of Claim 1 wherein the process produces a dry and contaminant free gas air stream that is subsequently distilled into its constituent components in a cryogenic air separation unit.